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~~IN THE UNITED STATES PATENT & TRADEMARK OFFICE~~

Application No.: 09/682,411
Filing Date: August 30, 2001
Inventor (first named): Tang
Group Art Unit: 1746
Examiner Name: Crepeau, Jonathan
Attorney Docket No.: 45283.4

Declaration Under 37 CFR Sec. 1.132

Province of Alberta
CANADA

I, (ERIC) ZHENG TANG, of the City of Calgary, Province of Alberta, Canada, hereby declare as follows:

I am a co-inventor of the above noted patent application.

I have a PhD in Materials and Chemical Engineering from University of Alberta, Edmonton, Canada, received in 1998. My thesis work was directly related to solid oxide fuel cells, and I have 8 years of direct work experience in developing solid oxide fuel cells. I am currently Manager of Research and Process Development with FuelCell Energy, Limited, in Calgary, Alberta, Canada. My current duties are to oversee research projects in an effort to produce a commercially viable solid oxide fuel cell product.

The Examiner has rejected the claims of my patent application on the basis of JP 2-87472 (JP '472). A copy of the English translation of JP '472 as provided the USPTO is appended hereto as Exhibit A.

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~~I have carefully reviewed JP '472 and believe that modifying it in the manner suggested by the Examiner would not carry a reasonable expectation of success. In fact, I believe that one skilled in the art would expect it to fail.~~

The purpose of the present invention is as stated in the Summary of the Invention section in para. 0008:

[0008] The present invention relates to electrodes which are applied to the electrolyte in a pattern. The pattern physically breaks a large monolithic electrode into a plurality of small discrete elements. Thus the stress caused by the thermal expansion mismatch will be limited to a much smaller area, with a corresponding reduction in strain at the interface of the small elements, thereby reducing delamination and increasing thermal cycling ability.

The Examiner has identified a primary difference between the claimed invention in this case and JP '472 as being the "polygonal" shape of the discrete electrode elements. As well, it is submitted that the fact adjacent polygonal electrode elements have parallel edges is also an important difference. Because of the polygonal shape, and parallel disposition of adjacent polygons, the polygons may be relatively tightly packed. Tight packing of the electrode elements allows maximization of the electrode surface in a defined area.

In this case, the gaps between the electrode elements are not required to allow gas diffusion through the electrode, as the electrode elements themselves are sufficiently porous. Therefore, in one embodiment, the gaps make up less than 5% of the surface area of the electrode. The minimization of gaps is an inherent property of tightly packed polygonal shapes, particularly regular hexagons.

However, in JP '472, the electrodes are defined as either stripes or dots which are vapour deposited. A vapour deposited electrode material, such as lanthanum cobaltite, will be fully dense and non-porous as suggested in the patent. Therefore, the spaces

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~~between the stripes or dots are necessary to provide gas diffusion channels so that reactant can access the triple-phase boundary among the electrolyte, the electrode material and the gas reactant.~~

Examiner has stated that the claimed polygonal shape of the electrode elements is a matter of choice which one skilled in the art would have found obvious in light of JP '472. I believe the opposite is true. In light of JP'472, one skilled in the art would not be motivated to use polygonal shapes. As stated above, the use of polygonal shapes facilitates tight packing of the elements. However, in JP '472, one is not motivated to tightly pack the elements. In fact, one is motivated oppositely - to provide loose packing to provide gas diffusion channels through the electrode and to increase the triple-phase boundary.

Based on the teachings of JP '472, one skilled in the art would not be motivated to make the gaps as thin as possible. If the gaps between the electrode stripes or dots in JP '472 was minimized to be in the range of 5% of the available area, there would simply not be enough triple-phase boundary to produce adequate power. There would certainly not be adequate gas diffusion to the limited triple-phase boundary. One skilled in the art would not be motivated to have such dense coverage because the possibility of success would be greatly diminished.

DECLARED this 12th day of October, 2004 at the City of Calgary, Province of Alberta, Canada.



(ERIC) ZHENG TANG

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